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## Microstructure simulator to predict grain formation during thermo-mechanical processing of long products

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**T**oday, temperature-controlled rolling is a well-known application in rolling mills to improve the technological properties of the materials in accordance with the market requirements. In comparison to standard operation procedures, this processing especially requires a reliable and holistic concept in daily operation. It becomes even more important, when special demands need to be met especially with fast reaction times concerning first results. In order to fulfill such demands successfully without the necessity of extensive test trials, an overall integrated concept for thermo-mechanical rolling of long products has been developed. Special attention is placed on a recently developed microstructure simulator. It is a semi-empirical model for temperature and process calculation predicting the resulting grain sizes, microstructure distribution and mechanical properties. Especially with its customized,

flexible database, which can be individually extended, the producers are enabled to react fast to market movements and specific requirements. The simulation software has its focus on the specific microstructure evolution of long products e.g. bar, wire rod and tubes. The simulation model features an analytic model to calculate strain distribution for different reduction configurations and varieties of technological parameters, e.g. temperature, speed, pass geometry for standard mill configurations as well as for the 3-roll technology. Based on the distribution of the strain modification and temperatures over the cross-section of the rolled product, the microstructure simulation is carried out to get a realistic image of the final obtained micro-structural formation.

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